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Sanitation

Progress in meeting the goals, targets and commitments of Agenda 21, the Programme for the Further Implementation of Agenda 21 and the Johannesburg Plan of Implementation

Report of the Secretary-General

Summary

During the 1990s, improved sanitation reached an additional one billion people in developing countries. Two billion more will need to gain access between now and 2015 if the international sanitation target is to be reached. This will require an approximate doubling of sanitation investments from the levels of the past decade to $7 billion a year in sanitation infrastructure alone. A multiple of that amount would be required to build adequate wastewater treatment capacity. With rapid urbanization and increasing urban population densities in much of the developing world, such costly investments will prove difficult to avoid if safe drinking water supplies are to be secured. Relatively low cost sanitation technologies exist, even for densely populated urban communities. Like other long-lived infrastructure investments, sanitation facilities need to be designed not just for current but for expected future demand, and they must be reasonably simple and cheap to operate and maintain throughout their useful life.

There is growing recognition that hardware investment needs to be complemented by programmes to raise awareness and promote improved hygiene and sanitation, particularly in schools. Women need to be integrally involved in sanitation planning, as they are usually most directly responsible for instilling habits of good sanitation and hygiene. They also bear a heavy burden from high infant and child mortality.

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The challenges of providing adequate sanitation are greatest in rapidly growing informal settlements, often located on the outskirts of the developing world's cities. Here, insecurity of tenure can hamper public investment in sanitation infrastructure. High population density combined with severe poverty creates a high-risk environment for the spread of disease. At the same time, in certain cultural contexts, the proximity of such communities to rural areas may open profitable opportunities, e.g., to use ecological sanitation technology to manage and treat human waste, removing pathogens before making it available as a nutrient to surrounding farmlands. Given the relatively heavy emphasis to date on water supply, the low sanitation coverage rates in much of the developing world, and the potentially large social benefits of proper sanitation and hygiene, these may deserve a higher priority among Governments and international donors in the future.

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I. Introduction

1. The present report reviews the state of implementation of the commitments, goals and targets on sanitation agreed upon in Agenda 21,[1] the Programme for the Further Implementation of Agenda 21,[2] Commission on Sustainable Development decision 6/1 on freshwater management and sanitation[3] and the Johannesburg Plan of Implementation of the World Summit on Sustainable Development.[4] The report also reviews the constraints and obstacles that countries have faced in the implementation of these goals and targets, and reflects on continuing challenges in the further implementation process. At its twelfth session, the Commission will conduct the first review of sanitation as a stand-alone topic by an intergovernmental body.

2. The focus of this review is on the collection and disposal of human wastes and the treatment of wastewater containing human wastes and other pollution with the aim of protecting human health and the environment. The report has been prepared on the basis of information provided in country reports and in reports by United Nations agencies and other international organizations. Some conclusions from regional and subregional meetings and activities have also been included. Issues relating to the management of solid waste are dealt with in the report of the Secretary-General on human settlements (E/CN.17/2004/6) and toxic chemicals and hazardous waste are discussed in the overview report (E/CN.17/2004/2).

3. The report reviews in particular on the progress made and challenges encountered in the implementation of the following goals and targets:

(a) To halve, by the year 2015, the proportion of people who do not have access to basic sanitation;

(b) To ensure, by the year 2025, that sanitation coverage is achieved in all rural areas;

(c) To improve sanitation in public institutions, especially schools;

(d) To promote safe hygiene practices;

(e) To promote affordable and socially and culturally acceptable technologies and practices;

(f) To integrate sanitation into water resources management strategies;

(g) To develop innovative financing and partnership mechanisms;

(h) To strengthen existing information networks.

4. The following are the primary sources of data and information used in the present report:

(a) Country reports and national assessments submitted by national Governments to the Commission secretariat;

(b) Monitoring information on water supply and sanitation from the Joint Monitoring Programme of the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), and other reports and contributions from those and other United Nations agencies, including the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the World Bank and the International Strategy for Disaster Reduction;

(c) Regional assessments prepared by United Nations regional commissions;

(d) Report of the task force on water and sanitation of the Millennium project.

5. The target to halve the number of people without access to basic sanitation by 2015 was defined for the first time at the World Summit on Sustainable Development, where access to sanitation was brought to the centre of the "poverty eradication" commitments.[5] It is an ambitious target, requiring the extension of coverage to an additional 2 billion people by 2015, roughly evenly divided between rural and urban areas.[6]

6. The rationale for including sanitation together with water supply in the Millennium Development Goals is clear. First, in many instances, clean drinking water supplies cannot be secured without adequate attention to sanitation, since human excreta remains one of the most serious sources of drinking water contamination. Second, water- and sanitation-related diseases remain among the biggest killers, especially of children. Mortality from diarrhoeal diseases declined from 4.6 million in 1982 to 1.8 million in 2002, mainly as a result of child survival programmes and oral rehydration therapy,[7] but it is still higher than mortality from tuberculosis and malaria.[8]

7. Despite this relative success in reducing child deaths, child diarrhoeal disease has not decreased significantly and remains one of the most important health problems worldwide. Lack of sanitation and poor hygiene are responsible for the transmission of diarrhoea, cholera, typhoid and several parasitic infections. Moreover, the incidence of these diseases and others linked to poor sanitation — e.g., roundworm, whipworm, Guinea worm and schistosomiasis[9] — is highest among the poor, especially school-aged children. These diseases have a strong negative impact on the health and nutrition of children and their learning capacities, and contribute to significant absences from school.[10] Trachoma can have far more devastating consequences, often leading to blindness. Women also suffer physically from having no accessible and safe toilet facilities, as they often wait until nightfall to defecate in the open — but this practice commonly causes gastric disorders.

8. The adverse impacts of poor sanitation can extend well beyond the direct impacts on health. Health risks and epidemics from waterborne diseases can greatly reduce tourism and agricultural exports, with economic costs much greater than the cost of investments in water supply and sanitation to address the problems.[11]

9. The benefits of sanitation systems and hygienic behaviour accrue largely to the wider community owing to reduced risk of transmission of infectious and parasitic diseases, more than to the individual. This contrasts with safe drinking water supply, whose benefits are mostly captured by the individual user (although water access also facilitates good hygiene). As a result, individuals are more likely to invest in, or demand public investment in, drinking water than in sanitation. Reflecting this demand, Governments in developing countries tend to invest more heavily in water supply than in sanitation.[12]

II. Access to sanitation services

10. While the Johannesburg Plan of Implementation and the sanitation-related Millennium Development Goals refer to the provision of "basic sanitation", the most widely used internationally comparable data[13] — as reported by the Joint Monitoring Programme of UNICEF and WHO — are for "improved sanitation".[14] Thus, the ensuing analysis uses the Joint Monitoring Programme terminology and data. Access to improved sanitation was extended over the 1990s to an additional 1 billion people worldwide, almost all in developing countries, raising the coverage rate from 51 per cent in 1990 to 61 per cent in 2000.[15] Progress has been made in both urban and rural areas: in urban areas, sanitation coverage increased from 80 to 84 per cent (representing an additional 573 million people), while in rural areas it rose from 29 to 40 per cent (an additional 436 million people). Even so, owing to population growth, the absolute number of unserved people declined only slightly, from 2.57 billion to 2.36 billion (table 1). In sub-Saharan Africa, the coverage rate declined slightly and in Oceania rather steeply (albeit from a high level), in East Asia coverage more than doubled and in South-Central Asia it increased by almost three quarters. While Asia remains the region with the lowest coverage, it is rapidly closing the gap with other developing regions. Figure 1 shows the distribution of the unserved population by region in 2000, and figure 2 indicates the population by region that would need to be served with improved sanitation in 2015, allowing for population growth, to meet the sanitation target of halving the proportion of the population without access in each region.[16]

Table 1
Percentage of people with access to improved sanitation facilities

	1990 coverage (percentage)			*2000 coverage (percentage)*		
Region	*Total*	*Urban*	*Rural*	*Total*	*Urban*	*Rural*
Global	51	80	29	61	84	40
North Africa	79	94	65	89	96	82
Sub-Saharan Africa	54	76	46	53	75	42
Latin America and the Caribbean	72	85	41	78	86	52
South-East Asia	53	73	44	65	80	56
South-Central Asia	22	52	11	38	70	25
Eastern Asia	18	56	2	44	70	28
Western Asia	81	95	57	84	97	60
Oceania	83	92	80	75	87	71
Europe	100	100	100	95	99	84

Note: Other developed countries have 100 per cent coverage in both years and are not shown.
Source: www.ssinfo.org/en.

Figure 1

Regional distribution of population not served with improved sanitation (2000): percentage of global total

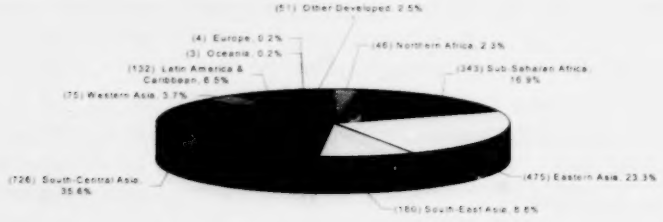
(millions of people in parentheses)

(16) Northern Africa, 0.7
(8) Europe, 1.6
(2) Oceania, 0.1
(31) Western Asia, 1.3
(116) Latin America & Caribbean, 4.9
(185) South-East Asia, 7.8
(911) South-Central Asia, 38.6
(303) Sub-Saharan Africa, 12.8
(761) Eastern Asia, 32.2

Figure 2

Population to be extended access, 2000-2015, to meet sanitation Millennium Development Goals: percentage of world total needing access

(millions of people in parentheses)


(51) Other Developed, 2.5%
(4) Europe, 0.2%
(3) Oceania, 0.2%
(46) Northern Africa, 2.3%
(132) Latin America & Caribbean, 6.5%
(343) Sub-Saharan Africa, 16.9%
(75) Western Asia, 3.7%
(726) South-Central Asia, 35.6%
(475) Eastern Asia, 23.3%
(180) South-East Asia, 8.8%

Sources: Figures 1 and 2 are based on data from the Joint Monitoring Programme web site (www.wssinfo.org/en/welcome.html) and *World Population Prospects: The 2002 Revision* (United Nations publication).

11. Definitions of access to improved sanitation differ somewhat across countries and regions. A review of definitions in African countries finds, for example, that of the responding countries, 82 per cent include public or shared latrines in the definition of improved sanitation, whereas the Joint Monitoring Programme does not. While the Joint Monitoring Programme approach reflects a concern that many public latrines are poorly maintained and often constitute a health hazard, the approach of some African countries may reflect a belief that, when properly maintained, these facilities can provide critical sanitation services for poor households.[17]

12. Countries and regions also differ considerably in terms of the type of sanitation most widely available. Many countries in Latin America and the Caribbean have high coverage of water-borne sewerage — 49 per cent of the population, compared with 13 per cent in Africa and 18 per cent in Asia — reflecting both a much higher rate of urbanization and a higher average living standard.

13. Achieving the sanitation Millennium Development Goals will be a major challenge, with an additional 2 billion people needing access by 2015. In terms of the number of people, South-Central Asia and East Asia pose the biggest challenge, with an additional three quarters of a billion people and half a billion people, respectively, requiring improved sanitation by 2015. Sub-Saharan African countries need to provide an additional one third of a billion people with improved sanitation by 2015 to meet the Millennium Development Goals target. The task will be especially difficult in countries where poverty and/or armed conflict are widespread.

14. From an examination of country data reported for 1990 and 2000,[16] certain countries in each region stand out as examples of progress in extending improved sanitation to their populations (increasing the coverage rate by 10 percentage points or more). In sub-Saharan Africa, Chad, Guinea-Bissau, Senegal and Zambia increased access significantly in rural areas, while Ghana achieved significant progress in urban areas. In East and South-East Asia, China more than doubled overall coverage, Viet Nam greatly improved access in urban areas and Thailand achieved almost universal coverage in rural areas. In South-Central Asia, both India and Pakistan more than doubled rural access, albeit from very different starting points. Box 1 below describes two examples of innovative practices in expanding access to sanitation. In Latin America and the Caribbean, Bolivia, Ecuador, Guatemala, Honduras, Nicaragua and Peru substantially increased coverage, particularly in rural areas.

15. However, as shown by household surveys of sanitation practices in Cambodia, Indonesia and Viet Nam, the existence of improved household sanitation facilities does not necessarily imply that they will always be used. In many households with latrines, individuals still occasionally defecate in fields and irrigation canals — which may be located at some distance from the village and latrine site.[18] Public education and information campaigns are also important in encouraging consistent use of sanitation facilities and promoting social norms in favour of their use.

Box 1
Innovative practices in improving sanitation access

There are a number of examples of communities working with local governments, non-governmental organizations or local entrepreneurs to provide low-cost sanitation systems in urban and rural areas of developing countries.

In India, the Sulabh Sanitation project provides sanitation services throughout the country and has grown into a formal private operator while retaining its non-governmental organization character. The municipal corporations in Hyderabad (population 5.2 million) and in Vijayawada (1 million) have entered into arrangements with Sulabh to supply pay toilets and/or subsidized toilets in slums. The community toilet complexes built and maintained by Sulabh International have significantly improved the surrounding environment, particularly in public places such as markets, bus stations and railway stations.

Bangladesh has adopted a community-based approach for building and improving sewage systems. The Secondary Towns Infrastructure Development Project is a participatory initiative with municipalities and non-governmental organizations, involving the installation of dustbins, twin pit latrines and shelters, and public toilets with biogas generators to cover 21 municipalities.

Source: United Nations Millennium Project Task Force on Water and Sanitation, February 2003, "Achieving the Millennium Development Goals in water and sanitation: background issues report", New York; Bangladesh country report submitted to the Commission.

16. In 1995, a survey of 14 countries found that many primary schools could not provide more than one latrine per 50 students, and that none of the surveyed countries had increased the number of school toilets by more than 8 per cent since 1990.[19] These findings confirm the general conclusions of the School Sanitation and Hygiene Education Programme (launched in 2000), which finds that the sanitary conditions of schools in both rural and urban areas in developing countries are often appalling, creating health hazards.[20] The Wash in Schools campaign, launched in 2003 by UNICEF and the Water Supply and Sanitation Collaborative Council, aims to provide water and sanitary facilities in schools to improve health and encourage girls to attend school.

A. Urban sanitation

17. In order to meet the sanitation target in urban areas, an additional 1 billion people would need to gain access to sanitation facilities by 2015,[21] taking into account population increase. The situation is particularly serious in peri-urban and informal urban settlements, where coverage is extremely low and untreated human waste threatens the water supply and human health.

18. In the coming decade, rapid urbanization will add greatly to the need for urban sanitation services in developing countries. Already in Asia, some 330 million people (almost one in every four urban-dwellers) lack access to improved sanitation facilities, accounting for 73 per cent of the world's unserved urban population. Thus, particular effort will be needed in that region.

19. Regions where large cities are growing rapidly are also those with low coverage of conventional sewers. Africa and Oceania have very low rates of sewered systems, while the industrialized regions of Europe and North America have high rates. Latin America and the Caribbean and Asia lie between them. Asia has done better than the other regions of the developing world in extending use of septic tanks and pour-flush systems. Septic tanks are also widely used in Oceania, where on average they serve nearly half the population of the largest cities, and in Latin America and the Caribbean, where they serve one quarter. In the large cities of Africa, septic tanks are not as common, and a larger proportion of the population uses pit latrines or ventilated improved pit latrines than in other regions.

20. There are cities in Asia and Oceania that could make greater use of dry pit latrines, particularly in settlements where the water supply is limited, expensive or unreliable. On the other hand, in parts of Africa and in Latin America and the Caribbean there is an unexploited potential for the use of pour-flush toilets, which can give a service that is aesthetically little different from a flush toilet, at a lower cost.

B. Rural sanitation

21. In order to meet the sanitation target in rural areas, improved sanitation services would need to be made available to an additional 1 billion rural people by 2015, representing a rate of increase almost double that of the 1990s.[22] In rural areas, it is the existing unserved population that needs to be covered, while in urban areas the increase is overwhelmingly owing to additions to the urban population — whether from natural increase or from in-migration.

22. The degree of imbalance between urban and rural coverage varies across regions. It is highest in South-Central Asia, where an urban resident is almost three times more likely to have access to improved sanitation than a rural one. In East Asia the figure is 2.5 times, while in sub-Saharan Africa it is 1.8 times. Large as the urban-rural coverage gap is, it was much smaller in 2000 than it was in 1990. For South-Central Asia, for instance, the 1990 urban coverage rate was almost five times the rural one. More strikingly, in East Asia the urban coverage rate in 1990 was more than 25 times the rural one. Thus, the biggest 1990s sanitation success story was the extension of rural coverage to an additional 213 million people in East Asia (more than a twelvefold increase). By contrast, in sub-Saharan Africa, the number of rural people covered by improved sanitation increased only slightly during the 1990s, by 16 million people, or 10 per cent. Achievements in Guinea, India and Thailand in expanding rural access to sanitation are described in box 2.

Box 2
Good practices in rural sanitation provision

In **Guinea**, the 1999 demographic and health survey found that 5 per cent of the population had acceptable sanitation and 51 per cent had no access to latrines at all. The programme for rural sanitation in upper and middle Guinea has brought about dramatic improvements in terms of family latrines and public latrines. Large improvements at the household level became possible in 1997 with the introduction of sanitary platform latrines, which were provided to some 1.5 million people (20 per cent of the population). An evaluation carried out in 2000 led to training of community leaders and rural authorities on the necessity of hygienic latrines and sanitary practices, and training of village masons to build the latrines. The rural authorities handle local management. A water sampling in 2000 found 69 per cent of samples entirely free of coliform bacteria, compared with 48 per cent in 1998. Significant improvements in standards of living have been possible with simple sanitation improvements.

In **India**, the Medinipur Intensive Sanitation Project in West Bengal involves a partnership between a multilateral agency, State and district governments, a religious non-governmental organization and voluntary grass-roots organizations. The project mobilizes the community through the delivery of sanitation messages and supports households to invest in on-plot latrines. While external funding was used to support technical innovation, participatory research, hygiene education and social marketing, direct funding of hardware was not included; households invested their own money, making use of small private providers to construct latrines. In the course of 10 years, roughly 1.2 million latrines have been delivered through the programme throughout West Bengal, increasing sanitation coverage from almost zero to 80 per cent.

In **Thailand**, for the past 40 years, the rural environmental sanitation programme has been integrated into the country's five-year economic and social development plans. By 1999, 92 per cent of the rural population had access to safe drinking water, and 98 per cent of rural families had built and were using sanitary latrines. As latrine coverage has increased, mortality related to gastro-intestinal diseases has decreased by more than 90 per cent. The programme's success depended crucially upon capacity-building: intensive training of project personnel and technical staff at local and national levels; and social mobilization and community health education conducted by mobile units and village volunteers. Other key components were: the promotion of water-sealed latrines; the provision of supplies, equipment and transport, as well as government-allocated revolving funds for latrine construction; systematic qualitative and quantitative monitoring of progress; awards for achievement; latrines as a residency requirement beginning in 1989; and research and development.

Sources: M. Weglin-Schuringa and O. Guene, "Evaluating rural latrines in Guinea 1998-2001", *Waterfront* (UNICEF 2002), 15:17-20; UNICEF, Sanitation: the Medinipur Story, Intensive Sanitation Project (UNICEF-Calcutta, India, 1994); K. S. Ramasubban and B. B. Samanta, 1994, "Integrated Sanitation Project", Medinipur (UNICEF-India, 1994); T. V. Luong, O. Chanacharnmongkol, and T. Thatsanatheb, "Universal sanitation in rural Thailand", *Waterfront*, 2002, 15: 8-10.

23. Some small island developing States have introduced sanitation programmes for rural areas. Most notable are the countries with economies based on tourism and ecotourism such as the Maldives, Seychelles and Mauritius. In these countries even rural access rates approach 100 per cent. Mauritius reports one of the most integrated sanitation strategies in Africa, encompassing management of sewage, wastewater treatment and reuse, research and cost-recovery.

24. Rural India poses the largest sanitation challenge in the coming decade, followed closely by China. Of a 2000 rural population in India of 730 million, only 15 per cent had sanitation coverage. In the same year, China's rural areas had some 600 million people without improved sanitation. In all of sub-Saharan Africa, there were only 250 million rural people lacking access to improved sanitation. If those two large countries can sustain high economic growth and distribute its benefits widely, they could well achieve the sanitation Millennium Development Goals.

25. A striking aspect of many of the better known "good practices" in the sanitation sector in rural areas is the absence of large-scale public funding. Research in Africa confirms that the role of the small-scale private entrepreneur in sanitation provision is significant,[23] and these findings are backed up by anecdotal evidence of a high degree of self-provision in East Asia. Despite the relatively low level of reported investment between 1990 and 2000, particularly in rural areas, the additional number of people served with sanitation was huge. A rough calculation suggests that the average reported cost of extending sanitation coverage to an additional 1 billion people during the 1990s was around $30 per person. One reason for this might be that much investment was made directly by householders in low-cost technologies.[24] These expenditures may not be fully reflected in official estimates of sanitation investments. New and more cost-effective approaches to sanitation emphasize the role of the household in sanitation investment and hygiene behaviour.

C. Sanitation infrastructure and facilities

26. Sanitation technologies and approaches necessarily differ across contexts, with solutions suitable for low-density rural areas not being suitable for high-density urban ones. Even within urban environments, however, experience points to numerous unsuitable approaches. For instance, a mid-1990s review of sanitation programmes found that they were often narrowly focused on specific technological fixes. Overly stringent technical standards and centralized approaches discouraged low-cost solutions, and insufficient attention was given to influencing household behaviour and investment decisions.[25]

27. A forthcoming multi-agency report on sanitation and hygiene programmes[26] argues the case for a more flexible approach based on local needs and conditions, and making use of indigenous innovations. It argues that sanitation solutions should be based, as far as possible, on what already exists or is commonly used, and what people want and are willing to construct, use properly and maintain. Also, contrasting experience in Cambodia, on the one hand, and Indonesia and Viet Nam, on the other, suggests that where projects fail to offer technical guidance in construction and to develop local supply skills for sanitary fixtures and construction materials, they tend to be less effective in extending coverage.[27] There is concern, however, that some flexible and responsive approaches may focus on immediate

needs and not take adequate account of long-term requirements (e.g., low-cost materials that are less durable and involve high maintenance costs).

28. Experience — in Brazil and Thailand for example — suggests that decentralized sewage collection and treatment systems can prove relatively cost-effective compared with conventional, centralized sewerage systems. Condominial sewers such as those pioneered in the State of Rio Grande do Norte, Brazil, reduce per capita costs of service by replacing traditional individual household connections to a public sewer with a system in which household wastes are discharged into branch sewers, which are then linked to the public sewer via a block connection. While originally developed for a low-income community, the approach has become widespread across a range of communities in Brazil. The Water and Sewerage Company of Brasília and the Federal District started implementing simplified (condominial) sewerage in poor areas in 1991 and now it considers this its "standard solution" for rich and poor areas alike.[28] Transferring the idea abroad, however, has not always been straightforward. For instance, efforts to introduce the same technology in Bolivia were hampered until an externally funded pilot project working with the utility company in La Paz/El Alto was able to demonstrate the applicability of the technology. This resulted in a national debate on the need to modify national norms and standards, which were subsequently revised.[29]

29. Another type of innovation involves separation of sewer networks into several smaller systems serving different zones within a city, as in Bangkok. The inner part of the city has been divided into 10 sewerage zones, each with an independent collection and treatment system. Each zone-level project is technically simpler than would be a city-wide project, and the Bangkok Metropolitan Administration has thus been able to implement a more affordable phased investment programme. The total sanitation investment for the 10 zones is lower than the amount that would have been required for a single project covering the entire city.

30. A few countries in Africa have made some progress towards improving flexibility and local innovation. Kenya, for example, has developed new building codes which allow latrines to be built in urban "special development areas" for low-income people. Still, only a limited number of local authorities have adopted the required by-laws or declared "special development areas". Zimbabwe developed the Ventilated Improved Pit latrine, an indigenous technology that has become a standard for low-cost rural sanitation programmes. The latrine, in a variety of guises, has been instrumental in increasing sanitation coverage in many places in Africa and Asia. Despite its success however, its cost is still prohibitive for the poorest families. Recent initiatives to promote simple hygiene interventions through Community Health Clubs have led large numbers of poor households in Zimbabwe to begin to practice safe sanitation even without a Ventilated Improved Pit latrine. This has caused a reassessment of the national approach to sanitation with a renewed emphasis placed on hygiene.[30] South Africa's innovative sanitation policy sets a "performance specification" for sanitation rather than defining technologies, and provides guidelines that lay out the need for both sanitation hardware and hygienic behaviour.

D. Equity and gender considerations

31. The need for improved access to sanitation in all communities, especially in poor areas, is specifically recognized in Agenda 21, which calls for the provision of adequate sanitation and waste services to populations in all rural and urban areas by 2025.[31] It also identifies the need to reduce the heavy workload of women and girl children through adequate sanitation facilities.[32] Investments in sanitation have been less effective than they might have been because, historically, most development institutions have neglected the role of the community and the need for equitable access to services.[25]

32. In most cultures, women are primarily responsible for the management of water resources, sanitation and health at the household level, as well as for childcare and education, but all too often, decisions about the design and location of water and sanitary facilities are made without the involvement of women. The inclusion of women in policy-making, planning and implementation can help ensure that facilities are designed and located to encourage use of the facilities and hygienic behaviour by all members of the family.

33. Latrine design can also inhibit use by small children, e.g. where the pit opening is wide. To address this problem, in Mumbai, India, children's toilets were specially designed to include smaller squat plates, handles to prevent overbalancing, and smaller pit openings into a shallow trench that is flushed regularly.[33]

34. The Water, Sanitation and Hygiene campaign, organized by the Water Supply and Sanitation Collaborative Council, is bringing its message to women and men in over 100 countries. The Council includes United Nations organizations, non-governmental organizations, bilateral donors, institutions and the private sector. International research presented at the World Summit on Sustainable Development demonstrates that washing hands with water and soap significantly reduces the risk of diarrhoeal disease.

III. Sanitation and wastewater treatment in integrated water resources management

A. Wastewater treatment

35. Protection of water quality, particularly in urban areas, requires not only collection of sewage but also purification and disinfection before the water is discharged into rivers, lakes or the ocean. Untreated wastewater that is used for drinking, washing or food preparation is a major cause of disease. Water pollution by household and industrial effluent can also reduce oxygen levels in lakes and rivers, contaminate food supplies, cause toxic algae blooms, kill or harm aquatic plants and animals and degrade aquatic ecosystems. Both Agenda 21 and the Johannesburg Plan of Implementation emphasize the need to prevent water pollution, reduce health hazards and protect ecosystems through wastewater treatment.[34] A particular challenge facing the small island developing States and coastal communities is protecting the marine environment, as well as freshwater sources, from waste and pollution.

36. Wastewater treatment systems may include removal of solid matter (primary treatment), biological digestion of dissolved organic matter and disinfection with chlorine or other disinfectants (secondary treatment) and removal of dissolved nutrients such as nitrates and phosphates and other dissolved pollution (tertiary treatment). It is difficult and expensive for a general wastewater treatment facility to remove heavy metals, pesticides and other toxic chemicals, which can more cost-effectively be eliminated at the source.

37. In developing countries, very little wastewater is treated before being returned to rivers or lakes and little progress is being made in improving the situation. In India, for example, 70 per cent of surface waters are polluted, and in China 54 of the 78 major rivers are seriously polluted with both human and industrial waste. Even in Latin America, where about half of the population is connected to sewer systems, most of the collected sewage is released into rivers and streams without treatment. In many developing countries, the wastewater treatment plants that do exist are inadequately managed and maintained or may be overwhelmed by excessive volumes of water, particularly at times of heavy rainfall, requiring the release of untreated water.[35]

38. The countries of Western Asia face problems of water pollution from domestic, industrial and agricultural sources. Sanitation systems exist in most metropolitan centres of high-income countries, and progress has been achieved in treating wastewater. Still, Lebanon has little proper wastewater or sewage treatment, and only 5 per cent of urban sewage is treated in the Islamic Republic of Iran. Saudi Arabia reports that only 20 per cent of industries have proper water treatment facilities. On the other hand, in Israel, 86 per cent of the wastewater is treated before being discharged to watercourses.

Table 2
Median percentage of wastewater treated by effective treatment plants

Region	*Percentage*
Africa	-
Asia	35
Europe	14
Latin America and the Caribbean	90
North America	66

Source: *Global Water Supply and Sanitation Assessment 2000 Report* (WHO/UNICEF publication) 2000.

B. Wastewater reuse

39. To respond to the challenges of water supply and water resources management, particularly where water is scarce, the international community, in Agenda 21 and the Johannesburg Programme of Implementation, called for the development of wastewater recycling and reuse.

40. Safe reuse of wastewater and excreta falls into two broad areas: the large-scale reuse of treated wastewater, usually for irrigation or industrial use; and reuse of treated excreta for household or local agriculture. In agriculture, wastewater for irrigating non-food crops requires less extensive treatment than wastewater used for food crops. Reuse of wastewater for agriculture is practised in almost all arid areas of the world, and numerous countries have established water resources planning policies based on reuse.[36]

41. In Western Asia, especially in the severely water scarce countries, progress has been achieved in treating and reusing wastewater. Several countries, including Jordan and the Gulf States, have integrated wastewater reuse into their national water schemes, with an emphasis on recycling industrial cooling water and reusing treated municipal liquid waste for irrigation.

42. The United States Environmental Protection Agency suggests that the best water reuse applications in terms of economic viability and public acceptance are those which use treated wastewater in place of drinking water for irrigation, environmental restoration, cleaning, toilet flushing and industrial use. Table 3 gives details of West Asian countries where water reuse is making a significant contribution to total water supply.

Table 3
Countries reporting significant reuse of water

Country	*Year for which data are available*	*Reclaimed water as a percentage of total*
Bahrain	1991	6
Cyprus	1997	11
Egypt	2000	1
Israel	1995	10
Jordan	1997	6
Kuwait	1997	15
Libyan Arab Jamahiriya	1999	1
Oman	1995	2
Qatar	1994	9
Saudi Arabia	2000	1
Syrian Arab Republic	2000	3
Tunisia	1998	1
United Arab Emirates	1999	9

Source: "Guidelines for Water Reuse" (forthcoming), (United States Environmental Protection Agency).

43. Household or local reuse of treated excreta has traditionally been practised in many countries, including China, Mexico, Viet Nam, Yemen and countries of Central America, and has more recently been introduced in Sweden. Such reuse of treated excreta should not be confused with traditional night-soil systems where untreated waste is collected and deposited either on the fields or at a disposal point. Such systems expose those who collect the night soil, among others, to grave health

risks. While generally not promoted by Governments, such systems are still widespread in a number of countries.

44. A modern approach, called "ecological sanitation" (box 3) uses faeces and urine, following treatment through dehydration or composting to destroy pathogens, for improving soil fertility and increasing agricultural production. Ecological sanitation uses very little water and is therefore particularly advantageous for areas of water scarcity. When used properly, these technologies ensure that wastes are treated, prevent pollution of ground- and surface-water bodies, generate a product that can be used locally or sold, and remove the need for water for flushing as in sewered systems.[37] However, where sanitation is not given high priority, there is concern that the introduction of relatively complex technologies involving handling of excreta may have significant health risks, particularly in urban areas.[38]

Box 3
Ecological sanitation in China

Although much progress was made in China during the 1990s, there are still 740 million people, mainly in rural areas, without access to sanitary means for excreta disposal. In 1999, the ecological sanitation (ECOSAN) pilot programme began in three provinces, supported by the Swedish International Development Agency (SIDA) and UNICEF. In China, around 93 per cent of agricultural households use human excreta as fertilizer. Added to this traditional practice is a sanitation facility which allows for the diversion of urine and the treatment of faeces so that the practice can be safe and the facility pleasant to use. In Guangxi county, ECOSAN is promoted as a comprehensive drive for a better village environment, and there are now 100 "ECOSAN villages", and ECOSAN facilities have also been constructed in schools.

The project has successfully demonstrated the viability of ecological sanitation technology, which uses no water, and causes no pollution or discharge. The project has been widely replicated, with government-supported construction of over 20,000 urine-diversion latrines in more than 15 provinces in China.

Source: UNICEF Water and Environmental Sanitation regional analysis, 2002.

C. Monitoring water quality and sanitation

45. The Global Environment Monitoring System (GEMS)/Water Programme of the United Nations Environment Programme (UNEP),[39] a global water quality monitoring and assessment programme, provides information on the state and trends of global inland water quality. The programme works with more than 100 partner countries and counterpart organizations within and outside the United Nations system to build capacity in developing countries for collecting and managing information on water quality. GEMS/Water has recently broadened the scope of its datasets to cover parameters related to wastewater and sanitation, including metals, persistent organic pollutants, water-borne pathogens and micropollutants.

46. Monitoring and assessment systems for water supply and sanitation services are seldom provided adequate resources, from the subnational to the international level. Historically, monitoring has focused on the presence or absence of particular physical facilities, rather than information about the functioning, use and reliability of systems. Monitoring systems that employ a sample survey approach (instead of, or in addition to, self-reporting methodologies) can provide more objective and accurate information, especially regarding hygiene behaviour.

47. Such monitoring is problematic, however, since it requires recording routine behaviour within the household, and little work has been done to develop reliable indicators. Research on hygiene that focuses on behaviour reported by the household often appears to be distorted by respondents' reporting desirable behaviours rather than actual behaviours.[40] On the other hand, a recent participatory assessment of sanitation programmes in Cambodia, Indonesia and Viet Nam has elicited a wealth of information from household interviews about sanitation behaviour before and after the households acquired access to a latrine.[41]

D. Humanitarian emergencies and natural disasters

48. Maintaining access to sanitation facilities in situations of conflict, emergencies or natural disasters can be a major problem. Breakdowns in sanitation systems and hygiene behaviour, often in very crowded situations, can lead to epidemics in conditions of limited health care. Globally there are 40 million international refugees and 100 million people displaced internally from their homes as a result of disaster, civil war and conflict.[35] Such conditions are particularly prevalent in sub-Saharan Africa, where up to one third of the people who die of malaria or cholera are from countries affected by natural disasters, wars and civil strife.[42]

49. The ability to maintain safe drinking water and hygiene in a time of crisis was illustrated by the experience of Orissa, India, in the aftermath of a 1999 super-cyclone, which caused massive flooding and contaminated thousands of tube wells. Despite this difficult situation, the health crisis was less than anticipated, as many people boiled their drinking water. The support of many aid organizations and mobile clinics promoted awareness of public health and hygiene issues.[43]

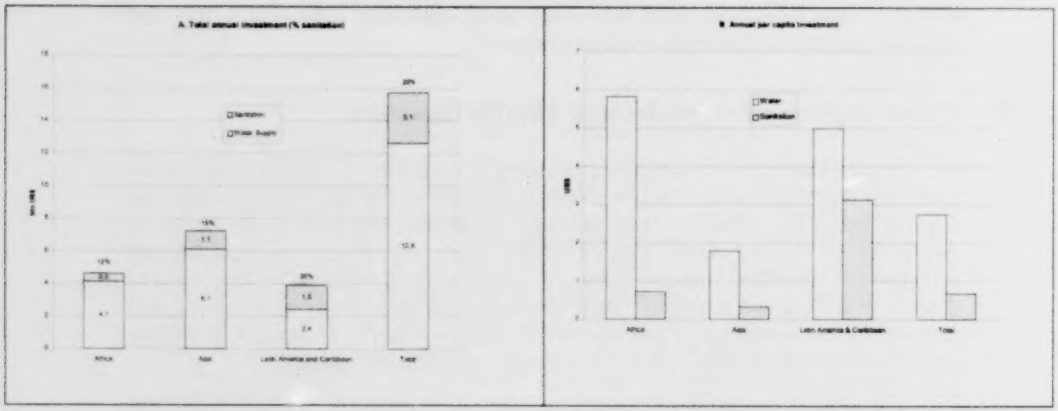
IV. Means of implementation

A. Financing

50. Developing country Governments face difficult choices in allocating limited budgetary resources, with water and sanitation investments competing with health care, education, roads, and other pressing needs. The same applies to donor funding. During the 1990s, only about 20 per cent of the $15 billion annual spending in developing countries on drinking water and sanitation projects has gone to sanitation (see figure 3). On a per capita basis, water supply investments were about 3.5 times larger than sanitation investments. Another $14 billion is invested annually in municipal wastewater treatment in developing countries.[44] By one estimate, close to 70 per cent of water and sanitation spending comes from government budgets, another 20 per cent from international development assistance of members of the Development Assistance Committee of the Organisation for Economic Cooperation

and Development (OECD) (an average of $3.1 billion per year in 1999-2001[45]), and the remaining 10 per cent from the international private sector and community/household investment.[46] Water and sanitation projects represent about 8 per cent of total donor aid commitments. In recent years, a larger proportion of official development assistance for water and sanitation has gone to smaller-scale systems: in the period 1995-1996, out of a total of 900 projects, 100 were valued at over $10 million, accounting for 70 per cent of total funding; in 1999-2000, only 75 out of 1,400 projects were large-scale in this sense, accounting for 60 per cent of total funding.[45]

Figure 3
Annual investment in drinking water supply and sanitation, 1990-2000



Source: *Global Water Supply and Sanitation Assessment 2000 Report* (WHO/UNICEF publication).

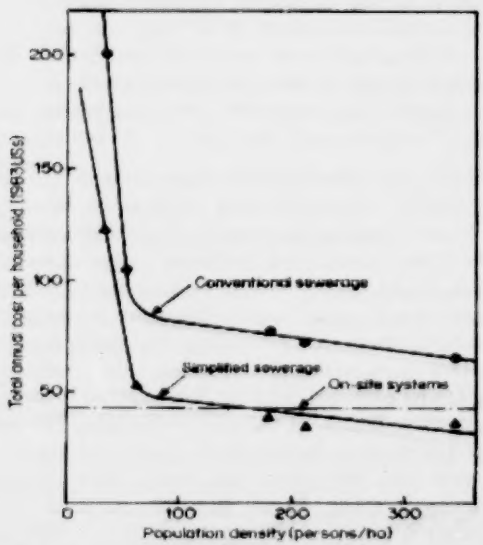
51. The operation and maintenance costs of non-sewered sanitation systems can be relatively large, involving, for example, regular removal and disposal of sludge from latrines and septic tanks and regular cleaning of toilets and latrines. These costs — and how they are to be covered — need to be considered when planning sanitation investments. Poorly maintained systems can actually exacerbate public health problems.

52. Estimates of the costs of meeting the 2015 sanitation target vary widely depending on the levels of service, technology and labour costs. For rural areas, the average investment costs could vary from about $10 per person for improving traditional practices and promoting sanitation and hygiene to $50 for a latrine to $140 for a septic tank system. For urban areas, the average investment costs could vary from about $25 per person for promoting sanitation and hygiene to $120 for a sewer connection with community labour to $160 for a conventional sewer connection. Basic wastewater treatment in urban areas would add about $300 per person, while tertiary treatment would add about $800 per person. The costs vary among regions and countries and the specific technologies used, and the above figures represent averages of costs in different regions in the 1990s.[47] Figure 4

indicates how the most cost-effective sanitation system can depend on population density as well as technology.

53. A very rough estimate of the total global costs of meeting the 2015 sanitation target in developing countries, by expanding access to sanitation for an additional 1 billion people in rural areas and 1 billion in urban areas, using an intermediate cost from the above figures, is about $7 billion per year for sanitation facilities and $53 billion per year for wastewater treatment. This would represent about double the $3 billion per year invested in sanitation facilities in the 1990s and three-and-a-half times the $14 billion invested in municipal wastewater treatment. Annual operation and maintenance is estimated at roughly 15 per cent of investment costs.[47] The $7 billion per year required for sanitation compares with about $26 billion required to meet the 2015 target for increased drinking water supply (see E/CN.17/2004/4).

Figure 4
Relative unit costs of different sanitation options



Note: Costs are for Natal, capital of the State of Rio Grande do Norte, Brazil, in 1983.
Source: Prepared by Leeds University and posted on www.sanicon.net/titles/topicintro.php3?topicId=8.

54. The costs of building urban sewerage systems can be spread to some degree through appropriate system design. For instance, municipal Governments can finance the trunk sewers, providing a single point of connection to neighbourhoods, whose residents assume collective responsibility for laying pipes connecting individual dwellings or other structures. Individual residents bear the costs of installing sanitary fixtures in their own dwellings. To minimize the burden on poor households, payment schemes can spread repayment of investment costs over time, for example by adding them to the monthly water and sanitation utility bills. Alternatively, low-interest loans could serve a similar purpose.

55. Residents of urban slums face particularly serious obstacles to attracting investment in sewerage and water infrastructure. Their lack of land tenure security, combined with uncertainties about the stability of such settlements, acts as a strong deterrent to investment. Public utilities may be discouraged from providing infrastructure so as not to legitimize residents' land claims. Also, fee collection can be difficult in such neighbourhoods, where there may not be any clearly demarcated housing plots and street addresses. Finally, slum residents may find it especially difficult to access formal credit markets for sanitation and other home improvements, given their inability to offer land as collateral.

B. Capacity development

56. Capacity development is needed at the professional and decision-making levels to promote new approaches to the provision of effective sanitation services. This is reflected in the call, in Agenda 21, for greater capacity for maintaining and managing systems to deliver sanitation in both rural and urban areas.[48] This call has not yet been followed by a noticeable increase in funding for technical training in this area. Much of the emphasis of international support in the water and sanitation sector currently appears to focus on integrated water resources management, and sanitation does not seem to feature prominently in any of the international capacity-building programmes (see, for example, the web sites www.cap-net.org and www.gwpforum.org).

57. A positive example is provided by the Inter-American Association of Sanitary and Environmental Engineering (AIDIS), which has been working on capacity-building in North, Central and South America for many years. With member organizations in 13 countries of the Latin America and Caribbean region as well as the three countries of North America, the association focuses on capacity-building in public health, including water supply, waste collection and treatment, air pollution and toxic waste disposal. Its efforts focus on promoting the technical and professional development of AIDIS members and supporting the reciprocal exchange of appropriate technologies and practices. In June 2002, national chapters of AIDIS in seven countries — Argentina, Brazil, El Salvador, Nicaragua, Panama, Paraguay and Peru — sent representatives on a study tour to the United States of America. In 2003, conferences were held throughout the United States and in Colombia, Haiti, Puerto Rico, Nicaragua, Chile, Brazil, Ecuador and Peru. Each national branch is expected to create a technical division in order to facilitate appropriate technology transfer.[49]

58. In Asia, several countries, including Japan, Singapore, Malaysia, Philippines and the Republic of Korea, report undertaking training programmes in the environmentally sound management of wastes. Other countries, such as Myanmar and Cambodia, report underdeveloped human capacities in the sanitation field and requirements for further capacity-building and training in the environmentally sound management of domestic and industrial wastes.

59. North African countries, including Algeria, Morocco and Egypt, have undertaken public campaigns to promote more responsible management of domestic wastes. Tunisia and Egypt report research, training and education activities in the field of waste management. Tunisia, through its international centre of environment technologies, has carried out many studies related to waste management. Mauritius

has diverse courses in management of wastewater offered through the University of Mauritius Faculty of Engineering, and continued staff training in solid and hazardous waste management is reported as a government priority. The Mauritius wastewater management authority supports research projects related to wastewater.

60. In the late 1990s, the Participatory Hygiene and Sanitation Transformation (PHAST) participatory methodology was developed in East and Southern Africa to build the capacity of communities to manage water and sanitation facilities and address hygiene issues, particularly for the prevention of diarrhoeal disease. PHAST toolkits can be used at the local level to guide communities in discussing methods and behaviours to reduce the incidence of diarrhoeal disease.

61. In Western Europe, several countries (particularly the United Kingdom of Great Britain and Northern Ireland) emphasize their cooperation through the European Union Phare assistance scheme for countries of Central and Eastern Europe, which includes wastewater treatment programmes, and the similar Tacis technical assistance scheme for the countries of the Commonwealth of Independent States. Technology transfer and capacity-building assistance to developing countries is highlighted by a few countries, including Austria, Germany, the Netherlands and the United Kingdom.

62. In Eastern European countries, special emphasis is placed on capacity-building and training. The Baltic Environmental Forum is organizing workshops on waste management issues for the environmental authorities of Estonia, Latvia and Lithuania.

C. Policy-making and participation

63. Key policy instruments to increase investment and the effectiveness of sanitation and hygiene have been recognized in international agreements,[50] including calls:

(a) To prioritize sanitation in national sustainable development strategies and regulatory frameworks;

(b) To implement national policies and incentives for waste minimization and improved reuse and recycling;

(c) To assign priority in water policies to ensuring safe drinking water and sanitation, preventing both microbial and chemical contamination;

(d) To enable community ownership of facilities.

64. Few countries have introduced dedicated regulatory and policy frameworks for sanitation. Recognizing the diversity of arrangements that can support effective sanitation investments, international forums have repeatedly called for strengthening of institutional capacity, periodic assessments of performance, and a particular focus on institutional arrangements that serve poor people, without specifying the need for dedicated sanitation or hygiene promotion agencies.[51]

65. Sanitation and wastewater treatment have generally not been adequately incorporated in national integrated water resources management plans or environmental policies. A recent review of the national environmental action plans

of 34 African countries found that while health was often mentioned as a concern, environmental health measures were rarely integrated into development strategies.[42]

66. Sanitation and wastewater treatment have also been generally neglected in poverty planning. A 2001 review of poverty reduction strategy papers[52] in the poorest countries of Africa found that, while sanitation was often cited as a pressing need at the community level, it was not included in national budget recommendations. A follow-up workshop concluded that sanitation professionals had not been adequately involved in the poverty reduction strategy paper process, and that this failing resulted from a lack of understanding of the role of public investment in increasing access to sanitation services.[52]

67. Some countries in Africa, however, do report the incorporation of sanitation into national water policies. Uganda adopted water resources and wastewater discharge regulations in 1998 and integrated sanitation into the national water policy. In Asia, most countries report national regulations and responsible bodies for policy-making on sanitation.

68. Many observers have argued that in sanitation and hygiene, which include intensely personal issues, progress is driven largely by decisions — over investments and behaviours — taken within the household. Single-agency approaches which focus on the delivery of a sanitation "product" may therefore have limited impact, and a single national "sanitation policy" may not be appropriate. Greater importance might be placed on aligning programmes and approaches in other sectors, including primary health care, water supply, urban infrastructure and education, in such a way that they all support improved sanitation and hygiene at the household level.[26]

69. Effective sanitation service delivery requires decision-making and control of resources at the appropriate level, which depends on national and local conditions.[53] Where large utilities provide appropriate services at reasonable costs — as is the case in many industrialized countries, parts of Latin America and other regions, and cities and towns in many parts of the world — local community involvement in the management of services may not be required. In all cases, however, users' interests need to be adequately represented and the risk of regulators' favouring suppliers' interests minimized.[35]

70. The importance of a coordinated approach to sanitation that supports both increased access to hardware for sanitary facilities and improved hygiene education was underlined in Agenda 21 and has been reconfirmed in subsequent international forums.[54] Unfortunately, there is a dearth of information on the extent to which changes in hygienic practices are being achieved. The World Bank carried out a review of its own lending in sanitation in 2000 and concluded that, while hygiene promotion was gaining in prominence, it was still found in only 17 per cent of projects with a sanitation component.[55]

D. Education and awareness-raising

71. An important role for communities in promoting behaviour change has been recognized in repeated calls to support education and outreach programmes (especially focused on children and adolescents), campaigns to encourage active

community participation in management of household waste, and training for women in maintenance of equipment for environmental sanitation.[56]

72. In one promising initiative, in early 2000, the School Sanitation and Hygiene Education programme[57] was launched in six countries: Burkina Faso, Colombia, Nepal, Nicaragua, Viet Nam and Zambia. By 2015, the programme aims to educate 80 per cent of primary schoolchildren about hygiene and to have all schools equipped with sanitation and hand washing facilities. Students are targeted both as direct beneficiaries and as agents of behavioural and attitudinal change within their families and their communities. The programme recognizes the importance of providing hygienic in-school sanitation facilities, taking into account the specific needs of female students.

73. Although there are numerous cases where education, training and outreach programmes have been successful,[58] there is only limited evidence of a shift in emphasis towards stronger community involvement in donor-supported sanitation projects and of higher priority attached to education and awareness-raising relative to infrastructure provision.

74. Much of the sanitation-related advocacy work is being spearheaded by international non-governmental organizations and other partnerships. There are several broad-based networks or partnerships, including the Water Supply and Sanitation Collaborative Council, the Global Water Partnership, the Gender and Water Alliance and the World Water Council and such non-governmental organizations as WaterAid, Oxfam, and Care International, among others. These organizations identify critical needs at global, regional and national levels, help design programmes for meeting these needs and serve as mechanisms for information exchange on water supply and sanitation issues.

V. Lessons learned and continuing challenges

75. The analysis of experience in improving access to sanitation suggests the following conclusions and continuing challenges.

Strategy and policy

76. Improved sanitation is essential to increasing the availability of safe drinking water, reducing disease, improving living conditions in human settlements and enhancing the status of women and girls, but very few countries have incorporated sanitation programmes explicitly into their national development or poverty reduction strategies. While water supply and sanitation often appear together in public statements, sanitation and hygiene tend to be neglected during the planning, policy-making, budgeting, and implementation phases, with the major share of effort and resources being allocated to water supply.

77. Given that many of the health and environmental benefits from improved sanitation accrue to the community at large, rather than to individuals or households, decision-making on sanitation cannot be left entirely to individuals or market mechanisms. Governments and community institutions play an indispensable role in expanding access to sanitation.

78. Sanitation and hygiene are in large part the result of private household decisions, and policies to promote improved sanitation must therefore seek to influence preferences and resource allocation decisions at that level. Governments can promote public awareness of the importance of sanitation and hygiene, provide capacity-building for community programmes, support small-scale providers, provide facilities in public and semi-public areas, and provide trunk sewers and wastewater treatment where needed.

Providing access to improved sanitation

79. **Access in dispersed rural settlements**. Effective demand for improved sanitation in rural communities is often very low, given high rates of poverty, limited institutional support for sanitation facilities, and "traditional" sanitation practices (e.g., defecation in agricultural fields). Education and awareness-raising programmes have to be designed carefully, based on sanitation technologies appropriate to the conditions. Suitable methods of financing sanitation investments also need to be devised — e.g., instalment repayments or contributions in kind (e.g., communal labour).

80. **Access for medium-density communities**. Sanitation planning at the rural-urban interface can be particularly challenging. While households in these communities often appreciate the convenience and status conveyed by toilets connected to sewers, the costs of these technologies may be prohibitive, and on-site facilities may be more cost-effective. It may also be possible to respond to the demand for sewerage service in such communities by adopting lower-cost technical options like condominial sewers or carefully designed and well-managed public facilities. Communities at the urban-rural boundary, with their volume of wastewater and proximity to agriculture, are often good candidates for recycling treated sewage water for agriculture. This practice can recover costs of treating sewage water while generating benefits in the form of irrigation water and fertilizer, but effective and reliable treatment must be ensured, particularly for irrigation of food crops.

81. **Access for high-density urban communities**. Improving sanitation in urban areas is one of the most complex challenges for meeting the water and sanitation targets. Given the high population densities and limited land availability, low-cost on-site technologies are often unworkable and can cause contamination of drinking water supplies. Conventional sewerage systems and wastewater treatment facilities are expensive to construct and maintain and cannot be financed through cost-recovery, particularly in low-income communities. In the past decade, innovative lower-cost approaches have helped reduce the financial barriers to expanding sanitation coverage. Mobilization of community resources — human and financial — can complement public investment in trunk sewers, as in the condominial model pioneered in Brazil. Long-term planning is important for ensuring that new systems are physically sustainable and cost-effective in the long run and for building infrastructure as part of urban development and expansion to avoid more expensive later upgrading of inadequate systems.

82. **Access to sanitation in schools and workplaces**. Just as adults spend much of their day at work away from home, so children spend much time at school. Even if families have sanitation facilities at home, they may not enjoy the full benefits of good hygiene if sanitary facilities are not available in schools and workplaces.

Increased interest in water, sanitation and hygiene in schools to contribute to a safe and healthy learning environment is a positive development and can accelerate progress towards the sanitation target. The lessons learned from various initiatives and programmes in this area provide a basis for replication and upscaling.

Mobilizing financial resources

83. Public funds make up the bulk of financial resources for investment in sanitation infrastructure, as is appropriate given the large social benefits of improved sanitation. Official development assistance has provided an important source of supplemental financing. In recent years, international development assistance for water and sanitation infrastructure has declined somewhat in both relative and absolute terms. At the same time, there appears to have been a shift in funding towards smaller-scale systems — though these still command a relatively small share of sectoral official development assistance resource commitments.

84. The resources invested in sanitation by households are difficult to measure but are thought to be substantial. Non-governmental organizations and community organizations have also mobilized substantial resources for sanitation, for both facilities and awareness-raising. While the international private sector is active in large-scale urban water supply, it is not heavily involved in providing sanitation infrastructure and services — with the partial exception of municipal wastewater treatment. The local small-scale private sector has, however, played a vital role in providing sanitation facilities in many countries, especially in rural areas. Local entrepreneurs can play a critical role in reaching the millions who are yet to be served, in both rural and urban areas.

85. While willingness (or ability) to pay for improved sanitation may not always be sufficient to cover the costs, it can be significant. Even as providers seek to tap the effective demand (actual or potential) for improved sanitation, there is a continuing public-good rationale for subsidizing sanitation, particularly for the poor. Moreover, as ensuring adequate sanitation is a public sector responsibility with large social benefits, particularly for people in poverty, its financing could be a higher priority for official development assistance.

Decision-making and awareness-raising with a gender focus

86. Women's key role in most cultures in shaping hygienic practices within households, in managing domestic water use, and in maintaining sanitation facilities argues for their active involvement in decision-making regarding the design and location of those facilities. Particular concerns include ensuring privacy and security, notably for girls and women and especially in common facilities, and designs that take account of specific needs, e.g., of small children.

87. Education programmes that foster understanding of the links between sanitation, hygiene, and health can contribute to increasing effective demand for improved sanitation. Evidence suggests that hygiene education campaigns are most effective among younger people, and students can be targeted both as beneficiaries and as agents of behavioural and attitudinal change within their families and their communities. Hygiene education in schools needs to be accompanied by the provision and maintenance of improved sanitation facilities at school premises.

Research and surveys suggest that separate facilities need be provided for girls and boys if girls are not to be discouraged from school attendance.

Choosing appropriate technologies

88. Many developing countries have been using technologies, system designs and technical standards that are not well suited to their conditions, as well as treatment processes that are more complex than necessary. Low-cost technologies that are technically simple and cheap to operate and maintain can be, in some contexts, an adequate substitute for more expensive large-scale water-borne sewerage systems. For wastewater treatment, there are also cheaper yet effective alternatives to the standard activated-sludge process. Such simpler technologies, where appropriate, can reduce the financial requirements of achieving the sanitation Millennium Development Goals. With the increased focus on sanitation following the World Summit on Sustainable Development, the United Nations system, other international organizations and non-governmental organizations are increasing efforts to disseminate these technologies and experiences internationally, including through new forms of partnership.

Notes

1 *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions adopted by the Conference*, resolution 1, annex II.

2 Resolution S-19/2, annex.

3 See *Official Records of the Economic and Social Council, 1998, Supplement No. 9* (E/1998/29), chap. I, sect. B.

4 *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

5 Ibid., para. 23 (a).

6 *Global Water Supply and Sanitation Assessment 2000 Report* (WHO/UNICEF publication). See also www.who.int/docstore/water_sanitation_health/Globassessment/Global3.3.htm. For an earlier commitment to sanitation, see *Vision 21: A shared vision for hygiene, sanitation and water supply and a framework for action* (Water Supply and Sanitation Collaborative Council, 2000).

7 Victora, C. G., Bryce, J., Fontaine, O. and Monasch, R., "Reducing deaths from diarrhoea through oral rehydration therapy". *Bulletin of the World Health Organization, 2000*, vol. 78, No. 10: 1246-1255.

8 WHO, *World Health Report 2003* (WHO publication), annex, table 2; see also Bateman, O. M. and McGahey, C., "Profile: A Framework for Action: Child Diarrhea Prevention", *Global Health Council*, 111, 28 September 2001.

9 "Strengthening interventions to reduce helminth infections: an entry point for the development of health-promoting schools" (WHO publication), 1997.

10 Nokes, C. and Bundy, D. A. P., "Compliance and absenteeism in schoolchildren: implications for helminth control", *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 1993, 87: 148-152; see also Miguel, E., and Kremer, M., "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities", February 2003, Department of Economics, Harvard University.

11 *Looking back; Looking ahead. Five decades of challenges and achievements in environmental sanitation and health* (WHO publication), June 2003.

12 Task Force on Water and Sanitation, Millennium Project, "Achieving the Millennium Development Goals for Water and Sanitation: What Will It Take?", interim full report, February 2004.

[13] The richness of the Joint Monitoring Programme data has increased over the years. Prior to the 2000 assessment, the main source of water supply and sanitation data were the service providers themselves. Starting with 2000, this source has been complemented by data from household surveys, which should provide a more accurate picture of actual access, including owner-built systems and reflecting the actual functioning of systems.

[14] The terminology used at the World Summit on Sustainable Development is access to "basic sanitation", whereas the term used in the UNICEF/WHO Joint Monitoring Programme report of 2000 is "improved sanitation". In choosing "basic sanitation" as its preferred terminology, the Summit was emphasizing behavioural change as well as technology in improving health and hygiene. The Joint Monitoring Programme data on "improved sanitation" focus on the technology — i.e., on types of toilets and excreta disposal systems to which households have access. In particular, for the Joint Monitoring Programme, improved sanitation refers to the following: connection to a public sewer; connection to septic system; pour-flush latrine; simple pit latrines; and ventilated improved pit latrine.

[15] Joint Monitoring Programme for Water Supply and Sanitation, WHO/UNICEF: data obtained from www.wssinfo.org/en/31_san_intro_en.html. Coverage rates, which generally divide the number of latrines by the number of households, may not always accurately reflect sanitation access and use. For instance, in many communities, two or more households construct and share use of a common latrine.

[16] WHO/UNICEF Joint Monitoring Programme web site (www.wssinfo.org/en).

[17] Water Supply and Sanitation in Africa: How to Measure Progress toward the Millennium Development Goals (World Bank, 2003), paper presented to a Southern African Development Community meeting on Water Supply, Sanitation and Hygiene, Gaborone, 4-7 August 2003.

[18] Mukherjee, N., *Achieving Sustained Sanitation for the Poor: Policy and Strategy Lessons from Participatory Assessments in Cambodia, Indonesia and Viet Nam*, Water and Sanitation Programme, April 2001.

[19] *Progress of Nations* (UNICEF publication), 1997.

[20] Burgers, L., Background and Rationale for School Sanitation and Hygiene Education (UNICEF), 3 November 2000 (www2.irc.nl.pdf/sshe/rationale.pdf).

[21] One possible source of upward bias in the data on urban access stems from the tendency of some providers to report universal coverage in an area where a sewerage system has been built, even though not all households are connected. Also, countries do not systematically record breakdown rates or systems that fall into disrepair.

[22] There is evidence that many households, especially in rural areas, make their own arrangements for sanitation outside formal service provision, and these data may not be fully captured by reporting mechanisms that rely on service providers, though they should be captured by household surveys.

[23] Collignon, B. and Vezina, M., Independent Water and Sanitation Providers in African Cities: Full Report of a Ten-Country Study Water and Sanitation Programme, 2000.

[24] *Global Water Supply and Sanitation Assessment 2000 Report* (WHO/UNICEF publication), p. 17.

[25] LaFond, A., 1995. "A Review of Sanitation Programme Evaluations in Developing Countries" (Environmental Health Project (EHP) and UNICEF), EHP activity report No. 5, Arlington VA.

[26] Water Supply and Sanitation Collaborative Council, United States Agency for International Development, *Sanitation and Hygiene Promotion: Programming Guidance* (UNICEF, 2004) (forthcoming).

[27] Mukherjee, N., *Achieving Sustained Sanitation for the Poor: Policy and Strategy Lessons from Participatory Assessments in Cambodia, Indonesia and Viet Nam*, Water and Sanitation Programme, April 2001.

[28] The Company has over 1,200 km of condominial sewers in operation — the largest example of simplified sewerage in the world.

[29] See www.wsp.org/condominial/indexeng.html.

[30] See Robinson, A., "VIP Latrines in Zimbabwe: From Local Innovation to Global Sanitation Solution. Field Note No. 4 in the Blue Gold Series, Water and Sanitation Programme — Africa Region, Nairobi", 2002; and Sidibe, M. and Curtis, V., "Hygiene Promotion in Burkina Faso and Zimbabwe: New Approaches to Behaviour Change Field Note No. 7 in the Blue Gold Series, Water and Sanitation Programme — Africa Region, Nairobi", 2002.

[31] Agenda 21, para. 21.39.

[32] Ibid., para. 24.3.

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[58] There are abundant cases of female masons working successfully in sanitation for example, and a number of projects have been designed specifically to build their capacity. Once trained, such women are often well-accepted and make a successful living, although few rise to senior positions on projects. A good strategy for poor women seems to be the formation of cooperatives that can provide mutual support and help to smooth over periods when work is less abundant. Good examples can be found in Lesotho, India, Sri Lanka, Kerala (India), Zimbabwe, Mozambique, Tonga, Jamaica, Nicaragua, Bangladesh and Nepal.